PATENT ABSTRACTS OF JAPAN

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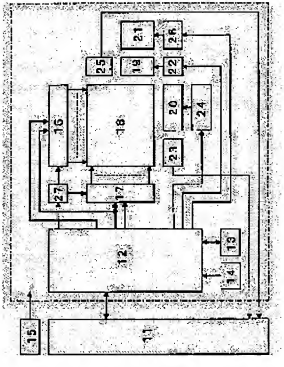
(71)Applicant : **NIPPON SEIKI CO LTD**
(72)Inventor : **KAWAMOTO MITSUO**
HATAKI KATSUHIRO
YAMADA KAZUYOSHI
UMEZAWA SACHIRO

(54) LIQUID CRYSTAL DRIVING DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To reduce a manufacturing cost of a whole liquid crystal driving device by providing a control circuit controlling a function other than display of a liquid crystal element integrally to a liquid crystal controller.

SOLUTION: A control circuit controlling a function other than display of LCD(liquid crystal device) 18 and a liquid crystal controller 12 are provided in the same integrated circuit. The liquid crystal controller 12 is provided with a register group setting various parameters in accordance with the LCD 18, and controls display of the LCD 18. This control circuit is constituted of a PWM frequency setting register, a PWM duty setting register, a frequency counter outputting a clock in which a clock is counted by a value of the PWM frequency setting register and frequency-divided, and a duty counter counting a clock outputted from the frequency counter by a value of the PWM duty setting register, outputting a H level until it reaches a register value, while outputting a L level until a counter is overflowed.



LEGAL STATUS

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[Date of final disposal for application]

[Patent number]

[Date of registration]

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CLAIMS

[Claim(s)]
[Claim 1] The liquid crystal driving gear characterized by establishing in one the control circuit which controls functions other than the display of said liquid crystal device for said liquid crystal controller in the liquid crystal driving gear which has the liquid crystal controller which controls said liquid crystal device based on the data which are equipped with the register group which sets up various kinds of parameters according to the liquid crystal device used as the candidate for a drive, and are held at those registers.
[Claim 2] The liquid crystal driving gear according to claim 1 said whose control circuit is a modulated light control circuit of the back light which illuminates said liquid crystal device.
[Claim 3] The liquid crystal driving gear according to claim 1 said whose control circuit is a thermal control circuit of the panel heater which heats said liquid crystal device.
[Claim 4] The liquid crystal driving gear according to claim 1 said whose control circuit is a thermal control circuit of the back light heater which heats the back light which illuminates said liquid crystal device.
[Claim 5] The liquid crystal driving gear according to claim 1 said whose control circuit is a driver voltage control circuit which adjusts the drive power circuit which drives said liquid crystal device.
[Claim 6] The liquid crystal driving gear given in any of claim 1 to claim 5 they are with which said control circuit consists of an PWM circuit.
[Claim 7] The liquid crystal driving gear given in any of claim 1 to claim 5 they are with which said control circuit consists of a digital-to-analog circuit.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] Especially this invention relates to the liquid crystal display controller which controls a display about the driving gear of a liquid crystal device (LCD).
[0002]
[Description of the Prior Art] For example, there are some which it is indicated by JP,6-27898,A and shown in drawing 4 as a liquid crystal driving gear for carrying out drive control of the dot-matrix type LCD.
[0003] In the liquid crystal driving gear shown in this drawing, CPU in which 11 manages the motion control of the whole circuit, and 12 are liquid crystal controllers which perform control of a display action under control of CPU11.
[0004] This liquid crystal controller 12 reads every 1 dot of indicative datas which wrote the indicative data sent from CPU11 in VRAM13 according to writing and the program memorized by ROM14 per screen one by one, makes them an indicative data, and is given to the segment drive circuit 16.
[0005] Moreover, the liquid crystal controller 12 gives the segment drive circuit 16 and a frame signal suitably to this segment drive circuit 16 and the common drive circuit 17 to timing in the common drive circuit 17 for the data shift signal according the data latch signal by the clock pulse to a clock pulse.
[0006] The segment drive circuit 16 drives the segment electrode (signal electrode) of LCD18 with the supply voltage from the driver voltage generating circuit 15 according to the indicative data, data latch signal, and data shift signal which are sent from the liquid crystal controller 12.
[0007] On the other hand, the common drive circuit 17 drives the common electrode (scan electrode) of LCD18 with the supply voltage from the driver voltage generating circuit 15 according to the data latch signal and frame signal which are sent from the liquid crystal controller 12.
[0008] LCD18 consists of one horizontal 640 dot x400 dot screen, and outputs an indicative data by the drive of the segment drive circuit 16 and the common drive circuit 17 with duty ratios 1/400.
[0009]
[Problem(s) to be Solved by the Invention] By the way, even if in the case of LCD18 carried in a car it equips with a back light 19 back and surrounding brightness changes, the device which offers a legible display to an operator is made, but since displays legible for an operator differ in day ranges and Nighttime and have a difference also by liking of an operator individual, the modulated light control function whose accommodation of display brightness is enabled is needed (technical problem 1).
[0010] Moreover, in order to make adaptation nature of liquid crystal to a surrounding temperature change into the optimal condition and to aim at improvement in the adaptation nature especially at the time of low temperature, the panel heater 20 which heats LCD18 is formed, and the function which controls this is needed (technical problem 2).
[0011] Moreover, in order to make the luminescence property over the temperature change of the perimeter in a back light 19 into the optimal condition and to aim at improvement in the luminescence property especially at the time of low temperature, the back light heater 21 which heats a back light 19 is

formed, and the function which controls this is needed (technical problem 3).
[0012] Furthermore, in order to keep the display grace of LCD18 good, the adjustment function of the liquid crystal driver voltage according to surrounding temperature is needed (technical problem 4).
[0013] About a technical problem 1, CPU11 controls the back light drive circuit 22 where the illuminance sensor (not shown) or operator stationed near LCD18 drives a back light 19 based on the signal from the volume (not shown) which can be set as arbitration (cure 1).
[0014] About a technical problem 2, CPU11 controls the panel heater drive circuit 24 which drives a panel heater 20 based on the signal from the panel temperature sensor 23 arranged near LCD18 (cure 2).

[0015] About a technical problem 3, CPU11 controls the back light heater drive circuit 26 which drives the back light heater 21 based on the signal from the back light temperature sensor 25 arranged near the back light 19 (cure 3).
[0016] About a technical problem 4, CPU11 controls the driver voltage circuit 27 which controls the electrical potential difference to the segment drive circuit 16 and the common drive circuit 17 based on the signal from the volume (not shown) which the illuminance sensor (not shown) or operator stationed near LCD18 can set as arbitration (cure 4).
[0017] according to this cure 1 - the cure 4, a technical problem 1 - a technical problem 4 are solvable -- on the other hand -- ** -- it carries out and the load to CPU11 becomes large, in order to provide this, a highly efficient microcomputer or a special microcomputer will be needed for CPU11, and it will become a liquid crystal driving gear expensive as a whole.
[0018]
[Means for Solving the Problem] In order to solve said technical problem, the liquid crystal driving gear of this invention is equip with the register group which sets up various kinds of parameters like according to the liquid crystal device according to claim 1 used as the candidate for a drive, and is characterize by to establish in one the control circuit which controls functions other than the display of said liquid crystal device for said liquid crystal controller in the liquid crystal driving gear which has the liquid crystal controller which controls said liquid crystal device based on the data currently hold at those registers.
[0019] Moreover, it is the modulated light control circuit of the back light with which said control circuit illuminates said liquid crystal device like according to claim 2. In this case, said control circuit consists of an PWM circuit (claim 6) or a digital-to-analog circuit (claim 7).
[0020] Moreover, it is the thermal control circuit of the panel heater with which said control circuit heats said liquid crystal device like according to claim 3. In this case, said control circuit consists of an PWM circuit (claim 6) or a digital-to-analog circuit (claim 7).
[0021] Moreover, said control circuit is a thermal control circuit of the back light heater which heats the back light according to claim 4 which illuminates said liquid crystal device like. In this case, said control circuit consists of an PWM circuit (claim 6) or a digital-to-analog circuit (claim 7).
[0022] Moreover, it is the driver voltage control circuit which adjusts the drive power circuit according to claim 5 said whose control circuit drives said liquid crystal device like. In this case, said control circuit consists of an PWM circuit (claim 6) or a digital-to-analog circuit (claim 7).
[0023]
[Embodiment of the Invention] It has the register group which sets up various kinds of parameters according to LCD (liquid crystal device)18 used as the candidate for a drive, and has the liquid crystal controller 12 which controls LCD18 based on the data currently held at those registers. The control circuit which controls functions other than the display of LCD18 for this liquid crystal controller 12 is established in one.
[0024] As said control circuit, it is in any of the modulated light control circuit of the back light 19 which illuminates LCD18, the thermal control circuit of the panel heater 20 which heats LCD18, the thermal control circuit of the back light heater 21 which heats the back light 19 which illuminates LCD18, and the driver voltage control circuit that adjusts the drive power circuit 27 which drives LCD18.

[0025] It is not necessary to use a microcomputer highly efficient beyond the need for CPU11 which controls the liquid crystal controller 12 by this, and a cheap thing can be used. Moreover, connection of the interface signal line between the liquid crystal display unit surrounded with the alternate long and short dash line and CPU11 located outside can be simplified.
[0026] moreover, said control circuit -- the PWM circuits 30-33 or the digital-to-analog circuits 40-41 -- since -- since adjustment possible fine tuning of PWM duty and fine can be performed by being constituted in the case of the former, and it does not need an analog-to-digital converter in being the latter, a configuration can be simplified.
[0027]
[Example] Although this invention is explained based on the example shown in the accompanying drawing, the same agreement is given to the same as that of said conventional technique, or a considerable part, and the detailed explanation is omitted in it. Moreover, refer to the applicable part of drawing 4 for the agreement part which does not appear in drawing 1 in the following explanation.
[0028] Drawing 1 is the block diagram showing the configuration of the example of this invention, and the illuminance sensor (not shown) or operator stationed near LCD18 computes the value set as the liquid crystal controller 12 based on the signal from the volume (not shown) which can be set as arbitration, and sets CPU11 as the liquid crystal controller 12. The liquid crystal controller 12 outputs a control signal to the back light drive circuit 22 based on the set-up value (cure of said technical problems 1 and 4).
[0029] The panel temperature sensor 23 detects the temperature near LCD18, and outputs it to CPU11. CPU11 computes the value which should be set as the liquid crystal controller 12 based on the output signal from the panel temperature sensor 23, and sets up the liquid crystal controller 12. The liquid crystal controller 12 outputs a control signal to the drive power circuit 27 and the panel heater drive circuit 24 based on the set-up value (cure of said technical problem 2).
[0030] The back light temperature sensor 25 detects the temperature near the back light 19, and outputs it to CPU11. CPU11 computes the value which should be set as the liquid crystal controller 12 based on the output signal from the back light temperature sensor 25, and sets up the liquid crystal controller 12. The liquid crystal controller 12 outputs a control signal to the back light heater drive circuit 26 based on the set-up value (cure of said technical problem 3).
[0031] Next, the circuit which is made to build in the liquid crystal controller 12, and controls functions other than the display of LCD18 is explained.
[0032] The liquid crystal controller 12 is equipped with the register group which sets up various kinds of parameters according to LCD18, and controls the display of LCD18 based on the data currently held at those registers.
[0033] Drawing 2 shows the example which constitutes said circuit from an PWM circuit. The PWM frequency setting register 30, The PWM duty setting register 31 and the frequency counter 32 which counted the clock by the value of the PWM frequency setting register 30, and carried out dividing and which carries out a clock output, While outputting "H" level until the PWM duty setting register 31 counts the clock outputted from the frequency counter 32 by the value and it becomes a register value for example It consists of a duty counter 33 which outputs "L" level until a counter overflows, and it is constituted in the same integrated circuit with the liquid crystal controller 12.
[0034] CPU11 computes an PWM frequency and PWM duty with the data from said illuminance sensor, said volume, the panel temperature sensor 23, and the back light temperature sensor 25.
[0035] Then, CPU11 is set up by writing the computed value in the PWM frequency setting register 30 in the liquid crystal controller 12, and the PWM duty setting register 31.
[0036] In this case, it has the effectiveness which can perform adjustment possible fine tuning of PWM duty and fine.
[0037] Drawing 3 shows the example which constitutes said circuit as a digital-to-analog circuit, consists of a digital data setting register 40 and the digital-to-analog section 41, and is constituted in the same integrated circuit with the liquid crystal controller 12.
[0038] The digital-to-analog section 41 outputs the electrical potential difference which pressured

partially the electrical potential difference impressed for example, to the analog supply voltage input terminal to the digital data setting register value as a control signal.
[0039] CPU11 computes digital data with the data from said illuminance sensor, said volume, the panel temperature sensor 23, and the back light temperature sensor 25.
[0040] Then, CPU11 is set up by writing the computed value in the digital data setting register 40 in the liquid crystal controller 12.
[0041] In this case, since the analog-to-digital converter which is needed separately in the case of drawing 2 is not needed, it has the effectiveness of simplification of a configuration.
[0042] By this configuration (drawing 1 - drawing 3), it is not necessary to use a microcomputer highly efficient beyond the need for CPU11 which controls the liquid crystal controller 12, a cheap thing can be used, and the cost of the whole liquid crystal driving gear can be reduced as a result.
[0043] Moreover, since control of the back light drive circuit 22, the panel heater drive circuit 24, and the back light heater drive circuit 26 is controlled not from CPU11 but from the liquid crystal controller 12 located in the liquid crystal display unit surrounded with the alternate long and short dash line, the number of the interface signal lines between said liquid crystal display unit and CPU11 located outside decreases compared with the former, connecting means, such as the part connector, are simplified, and it can realize the miniaturization of the whole liquid-crystal driving gear as a result.
[0044]
[Effect of the Invention] According to this invention, the cost of the whole liquid crystal driving gear can be reduced, and the miniaturization of the whole liquid crystal driving gear can be realized.

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TECHNICAL FIELD

[Field of the Invention] Especially this invention relates to the liquid crystal display controller which controls a display about the driving gear of a liquid crystal device (LCD).

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PRIOR ART

[Description of the Prior Art] For example, there are some which it is indicated by JP,6-27898,A and shown in drawing 4 as a liquid crystal driving gear for carrying out drive control of the dot-matrix type LCD.
[0003] In the liquid crystal driving gear shown in this drawing, CPU in which 11 manages the motion control of the whole circuit, and 12 are liquid crystal controllers which perform control of a display action under control of CPU11.
[0004] This liquid crystal controller 12 reads every 1 dot of indicative datas which wrote the indicative data sent from CPU11 in VRAM13 according to writing and the program memorized by ROM14 per screen one by one, makes them an indicative data, and is given to the segment drive circuit 16.
[0005] Moreover, the liquid crystal controller 12 gives the segment drive circuit 16 and a frame signal suitably to this segment drive circuit 16 and the common drive circuit 17 to timing in the common drive circuit 17 for the data shift signal according the data latch signal by the clock pulse to a clock pulse.
[0006] The segment drive circuit 16 drives the segment electrode (signal electrode) of LCD18 with the supply voltage from the driver voltage generating circuit 15 according to the indicative data, data latch signal, and data shift signal which are sent from the liquid crystal controller 12.
[0007] On the other hand, the common drive circuit 17 drives the common electrode (scan electrode) of LCD18 with the supply voltage from the driver voltage generating circuit 15 according to the data latch signal and frame signal which are sent from the liquid crystal controller 12.
[0008] LCD18 consists of one horizontal 640 dot x400 dot screen, and outputs an indicative data by the drive of the segment drive circuit 16 and the common drive circuit 17 with duty ratios 1/400.

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EFFECT OF THE INVENTION

[Effect of the Invention] According to this invention, the cost of the whole liquid crystal driving gear can be reduced, and the miniaturization of the whole liquid crystal driving gear can be realized.

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TECHNICAL PROBLEM

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[0010] Moreover, in order to make adaptation nature of liquid crystal to a surrounding temperature change into the optimal condition and to aim at improvement in the adaptation nature especially at the time of low temperature, the panel heater 20 which heats LCD18 is formed, and the function which controls this is needed (technical problem 2).
[0011] Moreover, in order to make the luminescence property over the temperature change of the perimeter in a back light 19 into the optimal condition and to aim at improvement in the luminescence property especially at the time of low temperature, the back light heater 21 which heats a back light 19 is formed, and the function which controls this is needed (technical problem 3).
[0012] Furthermore, in order to keep the display grace of LCD18 good, the adjustment function of the liquid crystal driver voltage according to surrounding temperature is needed (technical problem 4).
[0013] About a technical problem 1, CPU11 controls the back light drive circuit 22 where the illuminance sensor (not shown) or operator stationed near LCD18 drives a back light 19 based on the signal from the volume (not shown) which can be set as arbitration (cure 1).
[0014] About a technical problem 2, CPU11 controls the panel heater drive circuit 24 which drives a panel heater 20 based on the signal from the panel temperature sensor 23 arranged near LCD18 (cure 2).

[0015] About a technical problem 3, CPU11 controls the back light heater drive circuit 26 which drives the back light heater 21 based on the signal from the back light temperature sensor 25 arranged near the back light 19 (cure 3).
[0016] About a technical problem 4, CPU11 controls the driver voltage circuit 27 which controls the electrical potential difference to the segment drive circuit 16 and the common drive circuit 17 based on the signal from the volume (not shown) which the illuminance sensor (not shown) or operator stationed near LCD18 can set as arbitration (cure 4).
[0017] according to this cure 1 - the cure 4, a technical problem 1 - a technical problem 4 are solvable -- on the other hand -- ** -- it carries out and the load to CPU11 becomes large, in order to provide this, a highly efficient microcomputer or a special microcomputer will be needed for CPU11, and it will become a liquid crystal driving gear expensive as a whole.

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MEANS

[Means for Solving the Problem] In order to solve said technical problem, the liquid crystal driving gear of this invention is equip with the register group which sets up various kinds of parameters like according to the liquid crystal device according to claim 1 used as the candidate for a drive, and is characterize by to establish in one the control circuit which controls functions other than the display of said liquid crystal device for said liquid crystal controller in the liquid crystal driving gear which has the liquid crystal controller which controls said liquid crystal device based on the data currently hold at those registers.
[0019] Moreover, it is the modulated light control circuit of the back light with which said control circuit illuminates said liquid crystal device like according to claim 2. In this case, said control circuit consists of an PWM circuit (claim 6) or a digital-to-analog circuit (claim 7).
[0020] Moreover, it is the thermal control circuit of the panel heater with which said control circuit heats said liquid crystal device like according to claim 3. In this case, said control circuit consists of an PWM circuit (claim 6) or a digital-to-analog circuit (claim 7).
[0021] Moreover, said control circuit is a thermal control circuit of the back light heater which heats the back light according to claim 4 which illuminates said liquid crystal device like. In this case, said control circuit consists of an PWM circuit (claim 6) or a digital-to-analog circuit (claim 7).
[0022] Moreover, it is the driver voltage control circuit which adjusts the drive power circuit according to claim 5 said whose control circuit drives said liquid crystal device like. In this case, said control circuit consists of an PWM circuit (claim 6) or a digital-to-analog circuit (claim 7).
[0023]
[Embodiment of the Invention] It has the register group which sets up various kinds of parameters according to LCD (liquid crystal device)18 used as the candidate for a drive, and has the liquid crystal controller 12 which controls LCD18 based on the data currently held at those registers. The control circuit which controls functions other than the display of LCD18 for this liquid crystal controller 12 is established in one.
[0024] As said control circuit, it is in any of the modulated light control circuit of the back light 19 which illuminates LCD18, the thermal control circuit of the panel heater 20 which heats LCD18, the thermal control circuit of the back light heater 21 which heats the back light 19 which illuminates LCD18, and the driver voltage control circuit that adjusts the drive power circuit 27 which drives LCD18.
[0025] It is not necessary to use a microcomputer highly efficient beyond the need for CPU11 which controls the liquid crystal controller 12 by this, and a cheap thing can be used. Moreover, connection of the interface signal line between the liquid crystal display unit surrounded with the alternate long and short dash line and CPU11 located outside can be simplified.
[0026] moreover, said control circuit -- the PWM circuits 30-33 or the digital-to-analog circuits 40-41 -- since -- since adjustment possible fine tuning of PWM duty and fine can be performed by being constituted in the case of the former, and it does not need an analog-to-digital converter in being the latter, a configuration can be simplified.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] The block diagram explaining the configuration of the example of this invention.
[Drawing 2] The block diagram explaining the important section of an example of the liquid crystal controller of an example same as the above.
[Drawing 3] The block diagram explaining the important section of the other examples of the liquid crystal controller of an example same as the above.
[Drawing 4] The block diagram explaining the configuration of the conventional technique.
[Description of Notations]
11 CPU
12 Liquid Crystal Controller
18 LCD (Liquid Crystal Device)
19 Back Light
20 Panel Heater
21 Back Light Heater
22 Back Light Drive Circuit
23 Panel Temperature Sensor
24 Panel Heater Drive Circuit
25 Back Light Temperature Sensor
26 Back Light Heater Drive Circuit
27 Driver Voltage Circuit
30 PWM Frequency Setting Register (Control Circuit)
31 PWM Duty Setting Register (Control Circuit)
32 Frequency Counter Which Carries Out Clock Output (Control Circuit)
33 Duty Counter (Control Circuit)
40 Digital Data Setting Register (Control Circuit)
41 Digital-to-Analog Section (Control Circuit)

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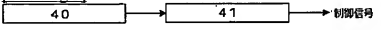
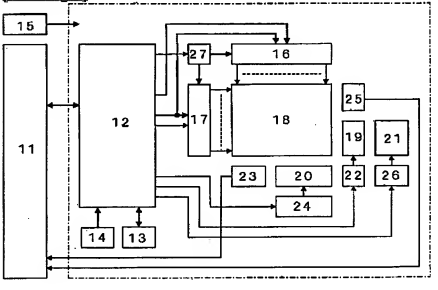
DRAWINGS

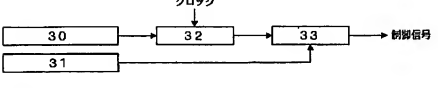
[Drawing 3]



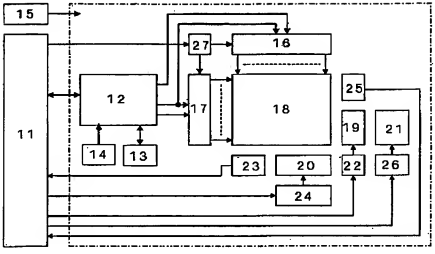
[Drawing 1]



[Drawing 2]



[Drawing 4]



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